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Exchange Rates and Purchasing Power Parity: Evidence Regarding the Failure of SFAS #52 to Consider Exchange Risk in Hyper-Inflationary Countries

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Evidence Regarding the Failure of SFAS #52 to Consider
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Abstract

Previous evidence by Aliber and Stickney [1975] indicates that exchange rates of most foreign countries move congruently with changes in price levels. Accordingly, Aliber and Stickney concluded that the validity of the Purchasing Power Parity theorem increases in the long run and fixed assets of foreign subsidiaries are not exposed to exchange risk. Their results support the practice of using historical cost and historical exchange rates for valuation of nonmonetary assets. This paper reports the results of extending the analysis for a longer period of time and focusing only on hyper-inflationary countries. By appealing to the Purchasing Power Parity theory to determine the appropriate exchange rate given the experienced inflation, the results indicate that fifteen of the eighteen hyper-inflationary countries have significant exchange risk and, therefore, the use of historical costs and historical exchange rates (as required by SFAS #52) is inappropriate.


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1.0 Introduction

The accounting for foreign operations and the reporting of exposure to potential exchange risk has great implications for many multinational corporations (MNCs) and their investors. The financial statements of MNCs are intended to provide one source of information regarding the effects of exposure to exchange risk. However, the accounting requirements of SFAS #52 fail to fully disclose exposure to exchange risk. This occurs since the implied assumptions, inherent in the required accounting practices, regarding the comovements of exchange rates with price level changes are not met in many hyper-inflationary economies.

This study empirically investigates the implicit assumptions of SFAS #52 in situations of hyper-inflation. The assumption that balance sheet items translated at the historical exchange rate are not exposed to exchange gains or losses is empirically shown to be false through application of the Purchasing Power Parity theorem. The empirical evidence supports the notion that most hyper-inflationary foreign countries systematically experience exchange risk exposure.

In the next section of this paper, the reporting requirements of SFAS #52 in hyper-inflationary economies and a brief discussion of the Purchasing Power Parity theorem are provided. The third section reports the empirical evidence regarding the long run validity of the Purchasing Power Parity theorem for eighteen countries which meet the SFAS hyper-inflation criterion. Countries in which favorable or unfavorable systematic exchange risk exposure exists are identified for a

number of hyper-inflationary countries. Examples regarding the effects of this problem on the balance sheet valuations of multinational corporations are demonstrated in the fourth section. The implications of the empirical results and a summary are discussed in the final section.

2.0 Background

FASB Statement Number 52 was accepted by the accounting community as a replacement for FASB Statement Number 8 because it seemed to alleviate the reporting problems of SFAS #8. However, other problems, such as exchange risk exposure, were overlooked by the new pronouncement.

SFAS #8 was very controversial and was attacked on the grounds that it required firms to report foreign currency translation gains or losses in the income statement. Many people believed that the reporting requirements of SFAS #8 had little correspondence with the actual economic condition of the firm. To supposedly achieve compatability of the reported results with the economic situation, SFAS #52 allows a firm the discretion (within certain guidelines) to select the foreign subsidiary's functional currency. The functional currency selected then determines the accounting method to be employed.

The required accounting practices of SFAS #52 can be summarized as follows:

(1) If the foreign subsidiary is deemed to be a conduit for U.S. operations in the foreign country or an extension of the domestic operations, the functional currency is the U.S. dollar. The accounting treatment in this case requires the monetary

assets and liabilities of the foreign operations to be translated at the current rate of exchange, revenues and expenses to be translated at the rate of exchange at the time of the transaction, and nonmonetary items are kept at the historical cost/historical rate of exchange. Gains and losses on the foreign currency adjustments are recognized in the income statement and the monetary balance sheet items are carried in the consolidated balance sheet at the current exchange rate. Nonmonetary items remain at the historical cost and historical rate of exchange in the consolidated balance sheet.

(2) If the foreign subsidiary is deemed to be a relatively self-supporting entity, the functional currency is the currency of the foriegn country. The foreign subsidiary's income statement is consolidated with the parent at the current rate of exchange and no gains or losses on foreign currency translation are recognized in the income statement. The balance sheet of the foreign subsidiary is consolidated with the parent at the historical cost adjusted for the current exchange rate.

(3) If the foreign subsidiary operates in a country that has experienced a cumulative inflation rate over a three year period equal to or greater than 100%, the functional currency is required by SFAS #52 to be the U.S. dollar and the accounting requirements are the same as for (1) above. Gains or losses on monetary assets and liabilities are included in income while nonmonetary items remain at the historical cost and historical rate of exchange.

Accordingly, in instances in which hyper-inflation exists, the nonmonetary items are carried at the original cost and the

original historical exchange rate. In essence, it is assumed that nonmonetary items are not exposed to exchange gains or losses since any exchange gain or loss would be offset by a change in the local currency price of the asset. As Aliber and Stickney [1975] point out, the use of the historical exchange rate for nonmonetary items is based on the belief that exchange gains and losses are offset by changes in the local currency prices of the nonmonetary items. This failure to consider the potential exchange risk for nonmonetary items presumes that the Purchasing Power Parity theory does hold.

The Purchasing Power Parity theory ties the change in the foreign exchange rate between two countries to the change in price levels for the two countries. Changes in the equilibrium exchange rate are proportional to changes in the ratio of foreign to domestic prices. Lee [1976] and Officer [1982] provide a current and extensive review of the Purchasing Power Parity theory.

Aliber and Stickney [1975] investigated the validity of the Purchasing Power Parity theory for 48 countries over the 1960 to 1971 time period. They concluded, that over fairly long time periods, the validity of the Purchasing Power Parity theory increases and that most assets and liabilities are not exposed to exchange gains and losses. However, Aliber and Stickney [1975] did not focus on hyper-inflationary countries and their technique to measure the parity error, on which they base their conclusion, may be suspect.

Intuitively, one might expect to observe larger deviations

between actual exchange rates and the theoretically determined parity exchange rates in countries with extremely high rates of inflation. These countries may undertake practices to keep their exchange rates higher than the purchasing power parity implied exchange rate or lower than parity if it is in their self interest to do so. If this does occur, one would expect to find the Purchasing Power Parity theory to be less valid in these hyper-inflationary countries and, therefore, the required use of historical cost and historical exchange rates to be inappropriate. In addition, systematic favorable long term exchange risk exposure will result in countries which keep their exchange rates lower than parity. Systematic unfavorable exchange risk exposure will occur when countries allow their exchange rate to rise higher than the implied parity rate. Evidence regarding the validity of the Purchasing Power Parity theory for hyper-inflationary countries as well as evidence of systematic favorable or unfavorable exchange risk exposure for long term assets is provided in the following section.

3.0 Empirical Evidence

Consumer price change information for 121 countries is surveyed from 1955 through 1983 in order to determine those countries which meet the SFAS #52 criterion for hyper-inflation. Table 1 provides a list of 18 countries which meet the criterion of a cumulative inflation rate of 100% over a three year period. The years of analysis are provided since information for all 28 years is not available for all countries. Table 1 also provides the average inflation rate as well as the high and low yearly

rate. For comparative purposes, the U.S. average inflation rate during the 1955-1983 period is 4.7% with a high of 13.5% and a low of -.3%.

INSERT TABLE 1

In order to determine the contemporaneity of meeting the SFAS #52 criterion, an additional analysis is conducted to determine the time periods in which the hyper-inflationary criterion is met. Sixteen of the countries meet the criterion during the 1980's and twelve during the 1970's. Ten of the countries meet the criterion during both the 1970's and the 1980's while none of the countries meet the criterion only prior to 1970. This implies that the hyper-inflation situation is contemporary in most of the countries. Table 2 summarizes the results.

INSERT TABLE 2

For each of the 18 countries the purchasing power parity exchange rate is computed based on the relative changes in inflation and the previous year's actual ending exchange rate. This extends the analysis of Aliber and Stickney [1975] for eleven of the hyper-inflationary countries. The purchasing power parity exchange rate is computed as:

$$E_{t-1} * (1 + I_f) / (1 + I_d) \qquad (1)$$

where E_{t-1} is the exchange rate at the end of the previous year, I_f is the current year consumer price level change for the foreign country, and I_d is the current year consumer price level change in the United States. The computed parity error is the actual end of the current year exchange rate less the implied

purchasing power parity exchange rate. Table 3 provides summary information regarding the number of years in which the error is positive or negative, the total error over the perriod of analysis, the average error, the cumulative % error, and the average % error.

INSERT TABLE 3

These results are fairly consistent with the findings of Aliber and Stickney [1975]. In most instances the parity errors are not systematically positive or negative and the average % error is quite small. This evidence seems to support the notion that the Purchasing Power Parity theorem holds in the long run and that there is little systematic exchange risk exposure.

However, this method of computing the implied purchasing power parity exchange rate treats every year as independent since the computation assumes that the beginning exchange rate (last year's end of the year rate) has been appropriately adjusted for changes in price levels that occurred in the preceding year. Accordingly, the parity error is only based on results for a single year and the error does not take into consideration any uncorrected parity errors from previous periods. The average % error is somewhat biased (understates the deviation from parity) when it is used to determine the existence of exchange risk on a long term basis. It portrays the <u>average yearly</u> exchange risk exposure and not the <u>yearly average</u> exchange risk exposure.

For example, assume a country experiences a rapid change in relative inflation during year 1 but no adjustment is experienced in the exchange rate. In the following years, the

exchange rate is adjusted on a basis consistent with the relative price level changes for each of the following years but the initial price level changes are ignored. Using the above method of determining the purchasing power parity error would indicate a small average % error as the number of years increases. However, the difference between the actual exchange rate and the parity exchange rate based on the cumulative changes in relative inflation could be quite large. This cumulative effect must be considered in the evaluation of long term exchange risk exposure.

As previous evidence indicates [Lee, 1976; Officer, 1982], the actual adjustment to parity may not occur in a single year but it may take place over a number of years. In instances such as this, one must consider the cumulative relative price level changes rather than the price level changes in each individual year. The exchange risk for a long term asset should be measured over the total life of the asset and it should portray the difference between the actual exchange rate and the parity exchange rate computed as if the exchange rate is appropriately and completely adjusted each year. Accordingly, the parity exchange rate to be used in the evaluation of long term exchange risk exposure should be computed as:

$$E^*_{t-1} * (1 + I_f) / (1 + I_d) \qquad (2)$$

where E^*_{t-1} is the implied parity exchange rate at the end of the previous year, I_f is the current year consumer price level change for the foreign country, and I_d is the current year consumer price level change in the United States. The parity error is computed as previously described. This parity error

computation provides a measure of the cumulative long term error that exists throughout the period of analysis. Failure of the exchange rate to adjust completely in one year (for the price level changes in that year) is carried through multiple years until a catch-up adjustment may occur. If no catch-up adjustment occurs, the parity errors of previous periods remain in the error computation and the measure is appropriate for the analysis of long run exchange risk exposure.

The parity error is recomputed for all 18 countries using the cumulative parity approach. The results of this analysis, provided in Table 4, are quite different than the previous findings.

INSERT TABLE 4

In most of the hyper-inflationary countries a significant difference is observed (both yearly and on a cumulative basis) between the actual exchange rate and the parity exchange rate. Of the 18 countries, 15 experience an average % parity error greater than 10%. The countries in which the average % parity error is greater than 10% include: Argentina, Bolivia, Brazil, Chile, Costa Rica, Ghana, Iceland, Israel, Mexico, Nicaragua, Somalia, Turkey, Uruguay, Yugoslavia, and Zaire. These results indicate that the Purchasing Power Parity theory is much less valid when cumulative inflation effects are considered. Only three countries can be classified as not being exposed to exchange risk over the period of analysis; Bangladesh, Peru, and Sierra Leone.

In addition, many of the countries experience a systematic favorable or unfavorable long run exchange risk exposure over the

analysis period. Of the 15 countries in which a significant average % parity error is observed, 7 countries experience a negative systematic average parity error. They are Argentina, Ghana, Mexico, Nicaragua, Somalia, Uruguay, and Yugoslavia. This situation (negative parity errors) occurs when the actual exchange rate for the domestic currency to the U.S. dollar is less than the implied purchasing power exchange rate. This leads to a favorable exchange risk exposure situation assuming that the price level in the foreign country of the fixed asset rises at the inflation rate. The relative price level of the asset rises faster than the exchange rate and the multinational corporation actually prospers from the situation. A numerical illustration of this situation is provided in Section 4.

Eight of the countries have a systematically positive parity error over the period of analysis. In these countries the actual exchange rate of the foreign currency for U.S. dollars is greater than that implied by the Purchasing Power Parity theorem. The actual exchange rate increases more rapidly than the relative price level. In this case, the multinational corporation is exposed to unfavorable exchange risk. The countries in which the evidence indicates systematic unfavorable exchange risk include Bolivia, Brazil, Chile, Costa Rica, Iceland, Israel, Turkey, and Zaire. A summary of the exchange risk exposure of all 18 countries is provided in Table 5.

INSERT TABLE 5

Countries in which the long run cumulative validity of the Purchasing Power Parity theorem is suspect are not accurately

portraying economic reality in their balance sheets. Through valuation of a foreign subsidiary's fixed assets at the historical cost and historical exchange rate, exposure to exchange risk is completely ignored and the asset's value may be systematically over- or understated. An illustration of favorable, unfavorable, and insignificant exchange risk exposure and its effect on the valuation of a fixed asset for financial reporting purposes is provided in the next section.

4.0 An Illustration Regarding the Effect of Exchange Risk on the Valuation of Fixed Assets

Assume that XYZ Corporation simultaneously purchases fixed assets in three different countries experiencing hyper-inflation. At the time of purchase the U.S. dollar value for each of the purchases is $100.00. The exchange rates for the three countries are:

Country A: 3.5 local currency units to $1.00

Country B: 20 local currency units to $1.00

Country C: 1 local currency unit to $1.00

The purchases in foreign currency units are:

Country A: 350.00

Country B: 2000.00

Country C: 100.00

Let us assume that there is 10% inflation in all three of the foreign countries and (for simplicity) there is no inflation in the United States. In Country A the actual exchange rate rises to 4.50 units to $1.00. The purchasing power parity implied exchange rate for Country A should be 3.85 units to $1.00

[3.5 * (1 + .10)/(1 + .0)]. The parity error is positive and the firm has experienced exposure to unfavorable exchange risk.

Given that the price level of the fixed asset rises at the inflation rate of 10%, the corporation could sell the asset in the foreign market for 385.00 which has a current exchange value in U.S. dollars of $85.50; the firm has experienced an economic loss of $14.50. Recall that for financial reporting purposes the asset would be valued at $100.00. The reporting requirements of SFAS #52 overstate the value of a fixed asset in situations of unfavorable long term exchange risk exposure.

In Country B the exchange rate rises during the period from 20.00 to 21.00 units per $1.00. In this instance a negative parity error occurs since the actual exchange rate is less than the parity exchange rate. The parity exchange rate is 22.00 units per $1.00 [20.00 * (1 + .10)/(1 + .0)]. In such situations, the corporation is exposed to favorable exchange risk. The price of the asset at the end of the period in the foreign currency is 2200.00 units. However, given the actual exchange rate of 21.00, the asset could be sold in the foreign market for 2200.00 which can be translated into U.S. currency as $104.76. The corporation has experienced an economic gain but the reporting requirements fail to disclose this event in any way on the firm's financial statements.

In Country C the exchange rate rises to 1.10 per $1.00 and the Purhasing Power Parity theorem holds; the firm is not exposed to foreign exchange risk. In this situation, the price of the asset rises to 110.00 but this increase in the price of the asset is offset by the increase in the exchange rate. The reported

value on the balance sheet of $100.00 is apporpriate since there is no exposure to exchange risk during the period.

These three cases illustrate the three possible scenarios regarding the exposure of fixed assets to exchange risk. Indeed, as Aliber and Stickney [1975] point out, when there is no exchange risk (Country C) it is quite appropriate to use the historical cost and historical exchange rate for balance sheet valuation. However, when the Purchasing Power Parity theorem does not hold (Countries A and B), fixed assets are exposed to exchange risk and the current reporting practices of SFAS #52 for subsidiaries in hyper-inflationary countries are deficient.

5.0 Summary and Conclusions

Using a cumulative perspective regarding price level changes and the Purchasing Power Parity theorem to measure the parity exchange rate error, this paper provides evidence which does not support the notion that fixed assets of subsidiaries operating in hyper-inflationary countries are not exposed to exchange risk. For most hyper-inflationary countries there is a large deviation between the actual exchange rate and an implied exchange rate that takes into consideration previous price level changes. Exposure to exchange risk exists for 15 of the 18 countries which meet the hyper-inflation criterion of SFAS #52. Seven of the countries have a favorable exchange risk exposure since the actual exchange rate is less than the implied parity exchange rate. Unfavorable exchange exposure, the actual exchange rate is greater than the implied parity rate, occurs in 8 of the hyper-inflationary countries.

These results contradict the findings of Aliber and Stickney [1975] and imply that the reporting requirements of SFAS #52 fail to consider exchange risk exposure in hyper-inflationary countries. To the extent to which the functional currency is the U.S. dollar and to the extent that exchange risk exposure exists in non-hyper-inflationary countries, the results of this study are generalizable to other foreign (non-hyper-inflationary) countries. The use of historical costs and historical exchange rates in financial reporting of fixed assets ignores exchange risk exposure and leads to mis-valuation of nonmonetary items on the statement of financial position.

Table 1. Hyper-Inflationary Countries

Country	Time Period	Average Inflation Rate	High	Low
Argentina	1955-1983	73.2%	443.2%	7.7%
Bangladesh	1972-1983	20.0%	54.7%	- 9.6%
Bolivia	1955-1983	37.9%	275.6%	- .7%
Brazil	1955-1983	44.0%	142.0%	10.0%
Chile	1964-1983	100.3%	504.7%	9.9%
Costa Rica	1955-1983	10.6%	90.1%	- .7%
Ghana	1955-1983	27.2%	122.9%	- 8.5%
Iceland	1955-1983	23.5%	86.0%	3.0%
Israel	1955-1983	31.6%	145.6%	1.7%
Mexico	1955-1983	14.8%	101.9%	.6%
Nicaragua	1973-1983	20.9%	48.2%	2.8%
Peru	1955-1983	24.5%	111.2%	4.8%
Sierra Leone	1955-1983	10.2%	69.7%	- 3.7%
Somalia	1955-1983	10.9%	58.8%	- 7.5%
Turkey	1955-1983	19.5%	110.2%	.4%
Uruguay	1955-1983	51.2%	125.3%	10.9%
Yugoslavia	1955-1983	15.9%	39.7%	1.4%
Zaire	1955-1983	25.7%	108.6%	- 2.7%

Table 2. Time Periods in Which the Hyper-Inflation Criterion are Met

Country	1950's*	1960's	1970's	1980's**
Argentina	X		X	X
Bangladesh			X	
Bolivia	X		X	X
Brazil		X	X	X
Chile			X	
Costa Rica				X
Ghana			X	X
Iceland			X	X
Israel			X	X
Mexico				X
Nicaragua				X
Peru			X	X
Sierra Leone				X
Somalia				X
Turkey			X	X
Uruguay		X	X	X
Yugoslavia				X
Zaire		X	X	X

* 1950's is limited to 1955-1959

** 1980's is limited to 1980-1983

Table 3. Summary of Computed Parity Errors

Country	Years of Analysis	Number of Years with Positive Errors	Number of Years with Negative Errors	Parity Error* Cumulative	Parity Error* Average	% Parity Error Cumulative	% Parity Error Average
Argentina	1956-1982	8	19	31797.1	1135.6	- 231%	- 8.0%
Bangladesh	1973-1983	6	5	8.2	.7	6%	.5%
Bolivia	1956-1983	11	17	- 88.2	- 3.1	- 63%	- 2.0%
Brazil	1956-1983	14	14	421.7	15.1	51%	1.0%
Chile	1965-1983	8	11	4.7	.2	34%	1.0%
Costa Rica	1956-1983	19	9	- 5.5	- .2	10%	.3%
Ghana	1956-1983	8	20	17.7	.6	- 304%	-10.0%
Iceland	1956-1983	11	17	7.7	.3	37%	1.0%
Israel	1956-1983	12	16	22.2	.8	66%	2.0%
Mexico	1956-1983	7	21	13.9	.5	- 9%	- .3%
Nicaragua	1974-1983	4	6	- 6.9	- .7	- 68%	- 6.8%
Peru	1956-1983	10	18	335.5	11.9	10%	.3%
Sierra Leone	1956-1983	12	16	.2	.0	- 10%	- 3.0%
Somalia	1956-1983	18	10	4.9	.2	- 64%	- 2.0%
Turkey	1956-1983	10	18	117.9	4.2	77%	2.0%
Uruguay	1961-1983	9	14	18.4	.8	- 88%	- 3.0%
Yugoslavia	1956-1983	8	20	51.7	1.8	- 2%	- .1%
Zaire	1956-1983	14	14	19.8	.7	24%	.8%

* foreign currency unit per U.S. dollar

Table 4. Summary of Computed Parity Errors Based on a Cumulative Parity Adjustment

Country	Years of Analysis	Number of Years with Positive Errors	Number of Years with Negative Errors	Parity Error* Cumulative	Parity Error* Average	% Parity Error Cumulative	% Parity Error Average
Argentina	1956-1982	1	26	-37095.1	-1324.8	- 4507%	-166.0%
Bangladesh	1973-1983	3	8	.1	.0	- 97%	- 8.0%
Bolivia	1956-1983	28	0	974.5	34.8	2403%	85.0%
Brazil	1956-1983	26	2	859.6	30.7	618%	22.0%
Chile	1965-1983	18	1	229.2	12.1	827%	43.0%
Costa Rica	1956-1983	28	0	102.6	3.7	550%	19.0%
Ghana	1956-1983	4	24	- 146.3	- 5.2	- 4261%	-152.0%
Iceland	1956-1983	24	4	38.6	1.4	916%	32.0%
Israel	1956-1983	22	6	86.3	3.1	565%	20.0%
Mexico	1956-1983	2	26	- 29.0	- 1.0	- 545%	- 19.0%
Nicaragua	1974-1983	3	7	- 15.9	- 1.6	- 158%	- 15.8%
Peru	1956-1983	10	18	824.1	29.4	- 258%	- 9.0%
Sierra Leone	1956-1983	6	22	- 1.1	- .0	- 129%	- 4.0%
Somalia	1956-1983	1	27	- 95.7	- 3.4	- 1294%	- 46.0%
Turkey	1956-1983	26	2	584.9	20.9	1177%	42.0%
Uruguay	1961-1983	5	18	- 40.6	- 1.8	- 517%	- 22.0%
Yugoslavia	1956-1983	27	1	- 163.6	- 5.8	- 1031%	- 36.0%
Zaire	1956-1983	28	0	36.5	1.3	1354%	48.0%

* foreign currency unit per U.S. dollar

Table 5. Hyper-Inflationary Countries and the Exposure to Long Run Exchange Risk

Insignificant Exposure	Favorable Exposure	Unfavorable Exposure
Bangladesh	Argentina	Bolivia
Peru	Ghana	Brazil
Sierra Leone	Mexico	Chile
	Nicaragua	Costa Rica
	Somalia	Iceland
	Uruguay	Israel
	Yugoslavia	Turkey
		Zaire

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